

1      Claims:

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- 3      1.      An optical fibre emulator, comprising:
- 4              an optical signal demodulator, having an input port for receiving a digitally-encoded
- 5                      optical signal and an output port for producing a digitally-encoded electrical signal
- 6                      corresponding to said digitally-encoded optical signal;
- 7              a digital shift register for propagating digital data encoded on said electrical signal, said
- 8                      shift register having an input port for receiving said digital data encoded on said
- 9                      electrical signal, an information transfer rate substantially equal to the information
- 10                      transmission rate of a section of optical fibre of given length for a given
- 11                      wavelength, and an output port for reproducing said digital data after a
- 12                      predetermined time delay; and
- 13              an optical signal modulator, having an input port for receiving said digital data from said
- 14                      output port of said shift register and an output port for producing a digitally-
- 15                      encoded optical signal corresponding to said digitally-encoded electrical signal, the
- 16                      information transfer time from said input port of said optical signal demodulator to
- 17                      said output port of said optical signal modulator being less than or equal to the
- 18                      information transfer time of said section of optical fibre.
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- 1        2.     The optical fibre emulator of claim 1, further comprising an optical signal attenuator,  
2            having an input port for receiving said digitally-encoded optical signal from said optical  
3            signal modulator and an output port for producing an attenuated version of said digitally-  
4            encoded optical signal.
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- 6        3.     The optical fibre emulator of claim 2, wherein the amount of attenuation introduced by  
7            said optical signal attenuator is substantially equal to the amount of attenuation  
8            experienced by an optical signal propagating through said section of optical fibre, and the  
9            information transfer time from said input port of said optical signal demodulator to said  
10           output port of said optical signal attenuator is substantially equal to the information  
11           transfer time of said section of optical fibre.
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- 13       4.     The optical fibre emulator of claim 1, wherein said shift register comprises a series of  
14           digital registers wherein data is shifted periodically from one to the next, and said output  
15           port may be selectively connected to any of said shift registers to vary the amount of time  
16           delay introduced by said shift register.
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1 5. The optical fibre emulator of claim 1, further comprising a serial-to-parallel bit converter  
2 disposed between said optical signal demodulator and said input port of said digital shift  
3 register so as to convert serial-bit digital data words received from said demodulator to  
4 parallel-bit data words for application to said shift register, and a parallel-to-serial bit  
5 converter disposed between said output port of said digital shift register and said optical  
6 modulator so as to convert parallel-bit data words derived from said shift register to serial-  
7 bit words for modulation of said optical carrier signal.

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9 6. The optical fibre emulator of claim 5, further comprising a digital decoder disposed  
10 between said serial-to-parallel bit converter and said input port of said digital shift register  
11 so as to convert a transmission code of a first length to a data code of a second, shorter  
12 length prior to application of said digital data to said shift register, and a digital encoder  
13 disposed between said output port of said shift register and said parallel-to-serial bit  
14 converter so as to convert said data code of said second length to said transmission code  
15 of said first length prior to application of said digital data to said parallel-to-serial bit  
16 converter.

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18 7. The optical fibre emulator of claim 6, wherein the length of said transmission code is 10  
19 bits and the length of said data code is 8 bits.  
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1 8. The optical fibre emulator of claim 6, further comprising an optical signal attenuator,  
2 having an input port for receiving said digitally-encoded optical signal from said optical  
3 signal modulator and an output port for producing an attenuated version of said digitally-  
4 encoded optical signal.

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6 9. The optical fibre emulator of claim 8, wherein the amount of attenuation introduced by  
7 said optical signal attenuator is substantially equal to the amount of attenuation  
8 experienced by an optical signal propagating through said section of optical fibre, and the  
9 the information transfer time from said input port of said optical signal demodulator to  
10 said output port of said optical signal attenuator is substantially equal to the information  
11 transfer time of said section of optical fibre.

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13 10. The optical fibre emulator of claim 1, further comprising a digital decoder disposed  
14 between said serial-to-parallel bit converter and said input port of said digital shift register  
15 so as to convert a transmission code of a first length to a data code of a second, shorter  
16 length prior to application of said digital data to said shift register, and a digital encoder  
17 disposed between said output port of said shift register and said optical signal modulator  
18 so as to convert said data code of said second length to said transmission code of said first  
19 length prior to application of said digital data to said optical signal modulator.  
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- 1 11. The optical fibre emulator of claim 10, wherein the length of said transmission code is 10  
2 bits per word and the length of said data code is 8 bits per word.  
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- 4 12. A method for emulating an optical fibre, comprising:  
5 receiving an input digitally-encoded optical signal and producing a digitally-encoded  
6 electrical signal corresponding to said input digitally-encoded optical signal;  
7 delaying said digital data for a predetermined time; and  
8 receiving said digital after said predetermined time and producing a delayed digitally-  
9 encoded optical signal corresponding to said digitally-encoded electrical signal, the  
10 information transfer time from receipt of said input digitally-encoded optical signal  
11 to production of said delayed digitally-encoded optical signal being less than or  
12 equal to the information transfer time of a section of optical fibre to be emulated.  
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- 14 13. The method of claim 12, further comprising attenuating said delayed digitally-encoded  
15 optical signal so as to produce an output digitally-encoded optical signal, the information  
16 transfer time from receipt of said input digitally-encoded optical signal to production of  
17 said output digitally-encoded optical signal being substantially equal to the information  
18 transfer time of said section of optical fibre.  
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- 20 14. The method of claim 12, further comprising selecting said predetermined time delay so as  
21 to correspond to said section of optical fibre.

1 15. The method of claim 12, wherein said step of receiving and reproducing said digitally-  
2 encoded electrical signal includes converting said electrical signal from serial-bit form to  
3 parallel-bit form, propagating said electrical signal through a transmission line of  
4 predetermined length at a rate substantially equal to the information transfer rate of said  
5 section of optical fibre, and then converting said electrical signal from parallel-bit form to  
6 serial-bit form.

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8 16. The method of claim 15, wherein said step of receiving and reproducing said digitally-  
9 encoded electrical signal further includes converting said electrical signal in parallel form  
10 from a transmission code of a first length to a data code of a second, shorter length prior  
11 to propagation, and, after propagation, converting said data code of said second length to  
12 said transmission code of said first length prior to converting said electrical signal from  
13 parallel-bit form to serial-bit form.

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15 17. The method of claim 16, wherein said transmission code is 10 bits per word and the length  
16 of said data code is 8 bits per word.  
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1 18. The method of claim 12, wherein said step of receiving and reproducing said digitally-  
2 encoded electrical signal further includes converting said digitally-encoded electrical signal  
3 from a transmission code of a first length to a data code of a second, shorter length prior  
4 to propagation, and, after propagation, converting said data code of said second length to  
5 said transmission code of said first length prior to producing a delayed digitally-encoded  
6 optical signal corresponding to said digitally-encoded electrical signal.  
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8 19. The method of claim 18, further comprising attenuating said delayed digitally-encoded  
9 optical signal so as to produce an output digitally-encoded optical signal, the information  
10 transfer time from receipt of said input digitally-encoded optical signal to production of  
11 said output digitally-encoded optical signal being substantially equal to the information  
12 transfer time of said section of optical fibre.  
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